

SECTION 15810

DUCTS

Edit to suit job requirements. This section does not include provisions for seismic requirements, underground ductwork, and commercial kitchens. Nuclear facilities may require additional requirements.

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes ductwork, duct cleaning, duct sealing, and duct leakage test.

1.2 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Catalog data for duct materials.
 - 2. Shop drawings indicating duct fittings, gages, sizes, and configuration for [] wg pressure class and higher.
 - 3. Test Reports indicating pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- B. Construct ductwork to NFPA 90A standards.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing work of this section with minimum three years experience approved by manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealant.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 PRODUCT SUBSTITUTION

- A. Refer to Section 01630.

2.2 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90.
- B. Steel Ducts: ASTM [A366] [A569] [A568].
- C. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- D. Stainless Steel Ducts: ASTM A167, Type [304.] [316.]
- E. Fasteners: Rivets, bolts, or sheet metal screws.
- F. Hanger Rod: ASTM A36; steel threaded both ends, threaded one end, or continuously threaded. Use galvanized steel or aluminum, 6061-T6, hangers in contact with aluminum duct.
- G. Hanger Straps: ASTM A653 galvanized steel having G90 zinc coating in conformance with ASTM A90.
- H. Structural Steel Members: ASTM A36 steel. Use aluminum, 6061-T6 or galvanized steel members for aluminum ducts.

2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings. Furnish duct material, gages, reinforcing, and sealing for pressure class indicated.
- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide single thickness turning vanes constructed and installed in accordance with SMACNA Standards. Vanes are not required in return air sound trap elbows and transfer ducts.
- C. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard.
- D. Provide, at a minimum, rectangular 45E entry fittings for rectangular ducts and 45E wye takeoffs for round ducts.
- E. Duct sizes noted are inside clear dimensions. For lined ducts, maintain duct sizes inside lining.
- F. Increase duct size gradually, not exceeding 15E divergence wherever possible. Do not exceed 30E divergence upstream of equipment. Do not exceed 45E convergence downstream of equipment.

2.4 FLEXIBLE DUCTS (INSULATED, LOW PRESSURE)

- A. Manufacturer: Flexmaster, Type 5
- B. Duct assembly of a trilaminate of aluminum foil, fiberglass, and aluminumized polyester, mechanically locked (no adhesives) into an aluminum helix formed on the ducts outside surface, insulation encased in a fire retardant protective barrier, duct UL listed 181 class 1, and complies with NFPA 90A.
 - 1. Pressure Rating: 6" w.g. positive, 4" w.g. negative, through 16" dia, 1" w.g. negative 18" and 20" dia.
 - 2. Rated Velocity: 4000 fpm
 - 3. Temperature Rating: -20EF to +250EF.
 - 4. Insulation: Fiberglass, C factor of 0.23 or less.

2.5 FLEXIBLE DUCTS (INSULATED, HIGH PRESSURE)

- A. Manufacturer: Flexmaster, Type 3
- B. Duct assembly of a trilaminate of aluminum foil, fiberglass, and aluminumized polyester, mechanically locked (no adhesives) into an aluminum helix formed on the ducts outside surface, insulation encased in a fire retardant protective barrier, duct UL listed 181 class 1, and complies with NFPA 90A.
 - 1. Pressure Rating: 12" w.g. positive, 5" w.g. negative, through 16" dia, 1" w.g. negative 18" and 20" dia.
 - 2. Rated Velocity: 5500 fpm
 - 3. Temperature Rating: -20EF to +250EF.
 - 4. Insulation: Fiberglass, C factor of 0.23 or less.

2.6 FLEXIBLE DUCTS (NON-INSULATED, LOW TO HIGH PRESSURE)

- A. Manufacturer: Flexmaster, Type NI-35
- B. Duct assembly of a trilaminate of aluminum foil, fiberglass, and aluminumized polyester, mechanically locked (no adhesives) into an aluminum helix formed on the ducts outside surface, insulation encased in a fire retardant protective barrier, duct UL listed 181 class 1, and complies with NFPA 90A.
 - 1. Pressure Rating: 12" w.g. positive, 5" w.g. negative, through 16" dia, 1" w.g. negative 18" and 20" dia.
 - 2. Rated Velocity: 6500 fpm
 - 3. Temperature Rating: -20EF to +250EF.

2.7 FLEXIBLE CONNECTIONS (EXPOSED TO SUN AND WEATHER)

- A. Manufacturer: Ventfabrics, Ventlon
- B. 24 gage metaledge ventlon (glass fiber coated with hypalon), fire retardant, UL Standard 214, and complies with NFPA-90A.
 - 1. Pressure Rating: 10" w.g. negative and positive.

2. Temperature Rating: -10EF to +275EF.

3. Weight: 26 oz/sq yd \pm 2 oz.

2.8 FLEXIBLE CONNECTIONS (INDOORS)

A. Manufacturer: Ventfabrics, Ventlon

B. 24 gage metaledge ventlon (glass fiber coated with hypalon), fire retardant, UL Standard 214, and complies with NFPA-90A.

1. Pressure Rating: 10" w.g. negative and positive.

2. Temperature Rating: -20EF to +200EF.

3. Weight: 30 oz/sq yd \pm 3 oz.

When specifying spiral seam ductwork, check the manufacturer's data for standard stock sizes.

2.9 SPIRAL ROUND DUCT

Machine made lock-seam duct with light reinforcing corrugations. Fittings, welded seam construction, manufactured of at least two gages heavier metal than duct.

2.10 FLAT OVAL DUCT

Machine made spiral lock-seam duct with light reinforcing corrugations. Fittings, welded seam construction, manufactured of at least two gages heavier metal than duct.

2.11 DUCT LINING

Duct liner (no more than 10ft in length) may be used upstream and downstream of fan systems for acoustical purposes. Exceptions must be approved by the LANL Fire Marshal.

A. Manufacturer: Certainteed, Ultra Liner and Childers CP-85 adhesive.

B. One piece (monolithic) fiber glass, ASTM E84 ratings at or below 25 flame spread and 50 smoke developed.

1. Thickness: 1 in

2. Velocity Rating: 4000 fpm

3. Temperature Rating: 250EF

4. Minimum Density: 1 1/2 lb.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connection before fabricating transitions.

3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Use double nuts and lock washers on threaded rod supports.
- D. Connect flexible ducts to metal ducts with draw bands.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Provide balancing dampers with indicating type locking quadrant where noted on drawings.
- G. Provide flexible connections with minimum 1 inch slack immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- H. Limit flexible ductwork to diffusers, terminal units, or light troffer boots, to 5 feet in length.
- I. Provide duct access doors for inspection and cleaning upstream of filters, coils, automatic dampers, fire dampers and equipment as indicated on drawings. Provide minimum 8 X 8 inch size for hand access, 18 X 18 inch size for shoulder access.
- J. Where indicated, weld or braze all duct joints and seams in accordance with AWS D9.1.
- K. Repair all surface damaged galvanized ductwork (welds, scratches, etc.) by applying a minimum 2 coats of a zinc base paint.
- L. Paint exposed ductwork in occupied areas to match surroundings, in accordance with Section 09900, Painting.

[Optional requirement, consult with user. Specify color if necessary.]
- M. Provide duct drops to diffuser same size as diffuser neck size.
- N. Seal openings around ductwork in fire-rated walls or floors with a UL-approved fire retardant sealant.
- O. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
- P. Secure duct lining with mechanical fasteners and adhesive per SMACNA duct liner standards and/or manufacturer's installation specifications.

3.3 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.

Use the following only on large systems.

- B. Clean duct systems with high power vacuum machines. Protect equipment with potential to be harmed by excessive dirt with filters, or bypass during cleaning. Install access openings into ductwork for cleaning purposes.

3.4 DUCTWORK MATERIAL SCHEDULE

Includes a material schedule when project contains more than one system with different duct materials. The following is an example of a schedule.

Fabricate ducts from galvanized steel except for the following air systems.

AIR SYSTEM	MATERIAL
Fume Hood Exhaust	Stainless Steel
Emergency Generator Exhausts	Steel

3.5 DUCTWORK PRESSURE CLASS

Each duct system is constructed for the specific pressure class or classes selected by the designer. This information must be noted on the drawings if the pressure class exceeds 1"w.g. For guidance on pressure classes, refer to SMACNA HVAC Duct Construction Standards, Metal and Flexible.

- A. Construct each duct system for a minimum pressure class of 1"w.g., unless otherwise noted on drawings.

3.6 DUCT SEALING

- A. Seal ducts in accordance with SMACNA HVAC Duct Construction Standards. Ducts with a pressure class of 2"w.g. and below shall meet Seal Class C.
- B. Do not use pressure-sensitive sealant on ducts with a pressure class of 1" w.g. or greater.

3.7 DUCT LEAKAGE

SMACNA and ASHRAE 90.1 do not require ducts constructed to 3"w.g. pressure class or lower be tested. ASHRAE 90.1, Standard for Energy Efficient Design of New Buildings except Low Rise Residential Builders, requires leakage tests as noted below for ducts with a pressure class in excess of 3" w.g. NOTE: The following may not apply to nuclear facilities.

- A. Leak test ducts with a pressure class in excess of 3" w.g. as follows:
 - 1. Test in accordance with the procedures outlined in Section 5 of the SMACNA HVAC Duct Leakage Test Manual, 1985, with tests reported using forms equivalent to those outlined in Section 6 of that manual.

2. The entire duct system need not to be tested. Tests may be made for only representative sections provided these sections represent at least 25% of the total installed duct area for the tested pressure class.
3. Tested duct leakage at a test pressure equal to the pressure class shall meet Leakage Class 6 as defined in Section 4 of the SMACNA HVAC Duct Leakage Test Manual, 1985.

END OF SECTION